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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/808,813	03/15/2001	Toshiaki Shimada	OCW-003	6330

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EXAMINER	
LEUNG, JENNIFER A	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/808,813	SHIMADA, TOSHIAKI	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 15, 2004 has been entered.

Response to Amendment

2. Applicant's amendment submitted on January 15, 2004 has been received and carefully considered. Claims 1-8 are cancelled. Claims 9-17 remain active.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai et al. (JP 05-319802) in view of Imoto et al. (JP 08-094610) and Sato et al. (JP 10-245202).

Regarding claims 9, 12 and 13, Kawai et al. (Abstract; Figures; Machine Translation) discloses a hydrogen occlusion alloy regenerating apparatus, as well as the corresponding method of regenerating the apparatus, wherein the apparatus comprises: a hydrogen reservoir **1** comprising a hydrogen-occlusion alloy **A-MH** or **B-MH**, capable of occluding and releasing

hydrogen; and a heating means (i.e., a heating apparatus **7**, comprising 1st heating apparatus **7a** and 2nd heating apparatus **7b**; section [0010]) for heating the hydrogen-occlusion alloy **A-MH** or **B-MH** up to a temperature that is higher than a temperature for normal release hydrogen, in order to remove impurities or "poisoning nature gas" that has adhered to the alloy (i.e., upon operation of 2nd heating apparatus **7b**, the alloy is heated to a temperature of 40 °C or more than the temperature of the 1st heating apparatus **7a**; section [0014]).

During normal operation, the hydrogen occlusion alloy **A-MH** or **B-MH** occludes hydrogen by cooling the alloy with a cooling system **8**, with valves **4a** and/or **4b** open and valves **5a** and/or **5b** closed (FIG. 1). The hydrogen occlusion alloy **A-MH** or **B-MH** then releases the occluded hydrogen by heating the alloy with the 1st heating apparatus **7a**, with valves **4a** and/or **4b** closed and valves **5a** and/or **5b** opened. However, after repeated occlusion and release, the alloy becomes deteriorated, and a regeneration operation is subsequently initiated. (See FIG. 3, which illustrates a progression of reduced hydrogen adsorption capacity, beginning with curve A, after regeneration, and ending with curve D, high deterioration after 12 hours of "poisoning").

Prior to regeneration, the hydrogen occlusion alloy **A-MH** or **B-MH** again releases the occluded hydrogen by heating the alloy with the 1st heating apparatus **7a**, with valves **4a** and/or **4b** closed and valves **5a** and/or **5b** opened. Next, the regeneration operation is initiated, wherein the hydrogen occlusion alloy **A-MH** or **B-MH** is heated with the 2nd heating apparatus **7b** to a temperature **T1** greater than the temperature achieved under normal operation by the 1st heating apparatus **7a**, for a time period from **t3** to **t4** (see FIG. 2; section [0014]). The impurities or "poisoning nature gas" adhered to the alloy will then be gradually emitted, and the alloy will be regenerated to its original hydrogen adsorption capacity (i.e., back to curve **A**, FIG. 3).

Additionally, Kawai et al. discloses a control unit **11** for controlling the heating apparatus **7** and cooling system **8** based on the detecting signal from a thermo sensor **2** located in the hydrogen reservoir **1** (section [0011]; FIG. 1). However, Kawai et al. is silent as to providing a "deterioration detection means" for signaling to the control unit **11** that the alloy has been deteriorated due to the deposition of the impurities or "poisoning nature gas" (i.e., Kawai et al. discloses the determination of a deteriorated state due to drop in hydrogen adsorption capacity, but is silent as to the corresponding means for enabling such determination). Kawai et al. is further silent as to a "remaining-amount detecting means" for signaling to the control unit **11** that an internal pressure of the hydrogen reservoir has fallen below a predetermined pressure due to the release of hydrogen (i.e., the internal pressure of reservoir **1** will inherently fall to a pressure below a predetermined pressure, "after mak[ing] hydrogen gas emit from a hydrogen storing metal alloy to time amount t1-t2." But Kawai et al. is silent as to providing a means for detecting the pressure at time t2; section [0014]).

Imoto et al. (FIG. 1, Abstract, machine translation) teaches a hydrogen occlusion alloy regenerating apparatus, as well as the corresponding method of regenerating the apparatus, wherein the apparatus comprises: a deterioration detecting means (mass-flow meter **4**) for sending a detection signal to control unit **6** when a hydrogen occlusion alloy **1**,**2** in a hydrogen reservoir has been deteriorated due to deposition of impurities; and a heating means (heater **8** or **9**; section [0012], [0014]-[0015]) for heating the alloy **1**,**2** based on the detection signal from the deterioration detecting means **4**. According to the specification, page 13 lines 7-10, "the fourth flow meter **52** has a function as a deterioration detection means," and according to page 15 lines 8-10, "heating circuit **56** associated with the second storage section **51** is used also as the heating

means." Thus, flow meter **4** and heaters **8**, **9** (operated by circuit **7**) meet the claim.

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a deterioration detection means to the apparatus and method of Kawai et al., because such means would provide added control over the regeneration operation by determining and appropriately signaling to the control unit that the alloy has been deteriorated due to the deposition of impurities and a regeneration operation needs to be initiated, as taught by Imoto et. Also, it is well known in the art to supply detection means to a control system in order to enable automatic and continuous operation and to insure adequate control over process variables.

Yabe teaches a hydrogen occlusion alloy regenerating apparatus, as well as the corresponding method of regenerating the apparatus, wherein the apparatus comprises: a hydrogen reservoir containing a hydrogen occlusion alloy (i.e., heat exchangers **1**, **2**; column 6, lines 34-61), a heating means (i.e., via indirect heating by waste heat fluid in lines **4**, **4A/B/C/D**; column 5, lines 3-16, 45-54), and a control unit (i.e., controller **15**). The apparatus further comprises a "remaining amount detecting means" (i.e., pressure sensors **16**, **17**) for detecting the remaining amount of hydrogen occluded in the alloy and sending a detection signal to the control unit **15** based on whether the internal pressure of the reservoir **1**, **2** has fallen below a predetermined pressure due to the release of hydrogen. As taught by Yabe (column 5, lines 35-45), "[w]hen a prescribed quantity of hydrogen gas has been released by the hydrogen-occluded alloy in the first heat exchanger **1**, the pressure in the first heat exchanger **1** drops. This change in the internal pressure is detected by the pressure sensor **16**, which outputs a signal to the controller **15** to switch the selector valves **5**, **8**, **9**, **12** and **14**," thus switching the hydrogen reservoir **1** from a heating mode to a different operating mode.

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a remaining-amount detecting means to the modified apparatus and method of Kawai et al. because such means would provide added control over the regeneration operation by determining and setting the end point at which the alloy has been suitably exhausted due to the release of hydrogen, such that the hydrogen occlusion alloy may be made ready for a different operating mode, as taught by Yabe. In the case Kawai, the remaining amount detection means would not only enable detection of an end point for subsequent absorption, like Yabe, but also an end point for subsequent regeneration, as both adsorption and regeneration operations occur after the alloy has been suitably exhausted due to the release of hydrogen. Also, it is well known in the art to supply detection means to a control system in order to enable automatic and continuous operation and to insure adequate control over process variables.

Regarding claims 10 and 14, Imoto et al. further disclose said deterioration detecting means **4** detects an amount of hydrogen occluded in said hydrogen-occlusion alloy **1** or **2** (i.e. "the effective amount of hydrogen movement"; Abstract), and sends the detection signal (via control unit **6**) if the amount of hydrogen occluded is smaller than an amount of hydrogen occluded when the hydrogen occlusion alloy is normal.

Regarding claims 11 and 15, although the collective teachings of Kawai et al., Imoto et al. and Sato et al. are silent as to specifically a "rate of occlusion", it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the rate of occlusion by merely dividing "the effective amount of hydrogen movement", as detected by the deterioration detecting means **4** above, by the operating time.

4. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai et al. (JP 05-319802) in view of Imoto et al. (JP 08-094610) and Sato et al. (JP 10-245202), and further in view of Gamo et al. (U.S. 5,976,725).

The same comments with respect to Kawai et al., Imoto et al. and Sato et al. apply (see comments in claims 9, 12 and 13 above). The collective teachings of Kawai et al., Imoto et al. and Sato et al. are silent as to whether the hydrogen released from alloy may be utilized for operating a fuel cell system. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to utilize the modified hydrogen occlusion alloy regenerating apparatus and method of Kawai et al. for supplying hydrogen to a fuel cell system, since the incorporation of such devices with fuel cell power generation systems is conventionally known in the art, as evidenced by Gamo et al. (column 1, lines 22-26). Gamo et al. teach that the use of hydrogen occlusion alloys provides a portable and safe means of supplying fuel to a fuel cell system since operating pressure is kept low (column 11, lines 26-28).

Response to Arguments

5. Applicant's arguments filed January 15, 2004 with respect to the rejection of claims 9-17 under 35 U.S.C. 103(a) as being unpatentable over Imoto et al. in view of secondary references have been considered, but are moot in view of the new ground(s) of rejection as necessitated by amendment.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
April 16, 2004 JAL

Hien Tran

HIEN TRAN
PRIMARY EXAMINER